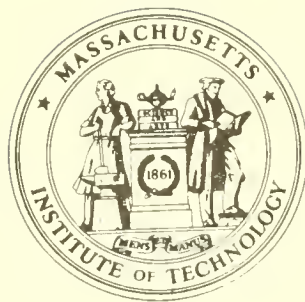




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OCCUPATIONAL UNEMPLOYMENT RATES: AN EXAMPLE
OF SOURCES OF BIAS IN ANALYSES OF
STRUCTURAL PROBLEMS IN THE LABOR FORCE*

by Malcolm S. Cohen and William H. Gruber

246-67

March 1967

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546-7

Occupational Unemployment Rates: An Example of Sources of Bias
In Analyses of Structural Problems in the Labor Force*

by Malcolm S. Cohen

and

William H. Gruber

This study shows that a research "finding" may often be completely dependent on the selection of a particular statistical series. This methodological observation is demonstrated in an analysis in labor economics and it is shown how "findings" on the same question vary as different statistical sources are used in the analysis.

This paper is an exercise in the use of labor force statistics.

The U.S. Bureau of Labor Statistics has made a rapidly increasing quantity of labor data available to economists. The data permutations that are possible have increased in conjunction with the use of computers, which allow great ease in data manipulation. This paper presents findings on the cyclical behavior of employment and unemployment for laborers and craftsmen, but these findings should be considered of secondary importance. The main contribution that the authors hope to make is to the better understanding of the uses of labor force data.

*The authors are grateful to Edwin Kuh, Robert Solow, Charles Myers and George De Menil for many helpful comments. The authors acknowledge their research support from the Sloan School of Management and the Center for Space Research, both at M.I.T.

Economists concerned with whether or not there has been an increase in structural difficulties in the labor force have been interested in the study of changes in the structure of unemployment rates by occupation of last attachment.¹ Occupational unemployment rates have also been used to support a theory of cyclical fluctuations in wages and unemployment.²

We have noted elsewhere that the use of unemployment rates for economic analysis can be subject to a number of possible biases.³ To illustrate these biases in this paper, we test the hypothesis that the employment of unskilled workers falls relative to that of skilled workers from the peak to the trough of a recession. The theory underlying this hypothesis is more thoroughly developed elsewhere,⁴ but a short summary follows: Businessmen may hoard

¹See U.S. Congress, Joint Economic Committee Subcommittee on Economic Statistics, Higher Unemployment Rates, 1957-1960: Structural Transformation or Inadequate Demand, 87th Congress, 1st session (Washington, D.C.: Government Printing Office, 1961); Robert M. Solow, "The Nature and Sources of Unemployment in the United States." 1964 Wickcell Lectures (Stockholm: Almquist and Wickcell, 1946); Lester Thurow "The Changing Structure of Unemployment: An Econometric Study," The Review of Economics and Statistics (May, 1965), pp. 137-149; R. A. Gordon "Has Structural Unemployment Worsened?" Industrial Relations, Vol. 3, (May, 1964), pp. 53-77.

²See M. W. Reder, "Wage Structure and Structural Unemployment," Review of Economic Studies, October 1964, pp. 309-322.

³See W. H. Gruber and Malcolm S. Cohen, "The Question of Structural Unemployment: A Methodological Evaluation," MIT Sloan School of Management Working Paper No. 159-66 (March 1966) and W. H. Gruber, "The Use of Labor Force Participation and Unemployment Rates as a Test for Structural Difficulties," IRRA Proceedings, Spring, 1966.

⁴See Edwin Kuh, "Cyclical and Secular Labor Productivity in United States Manufacturing," The Review of Economics and Statistics, February 1965, pp. 1-12; Malcolm S. Cohen "The Effect of Wages on the Relative Employment of Unskilled Labor," The Report of the National Commission on Technical Change, Automation and Economic Progress, footnote 26, (Washington, D.C.: Government Printing Office, 1966). This theory is implicit in much of the literature on structural unemployment. For example, see Higher Unemployment Rates..., op. cit. p. 49.

skilled laborers rather than fire and rehire them, since the cost of rehiring during the anticipated expansion may exceed the costs of hoarding. Because the cost of hiring unskilled workers is less, fewer unskilled workers will be hoarded, and thus the relative employment of unskilled workers will fall during a recession.

This theory about employer behavior is related to the structure of employment, not of unemployment. Previously, economists have engaged themselves primarily in studies of structural problems concerning unemployment. One purpose of this paper is to make it manifest that changes in the rate and structure of unemployment, contrary to expectation, do not follow the changes in employment. A second objective is to focus the reader's attention on sources of bias which are inherent in analyses of structural conditions in the labor force.

Much of the data presented is subject to substantial sampling error. This must be understood in connection with any conclusions about specific findings. A considerable loss in the accuracy of labor force statistics occurs when one shifts from annual averages to quarterly or monthly data, and when one begins to examine disaggregated data.⁵ This paper will present some of the data choices that are available for the analysis of labor force data, and the effects that result from choosing different sets of data to test an hypothesis.

⁵Of course if sampling variances were available, it would be possible to test rigorously all hypotheses presented by determining whether differences in reported rates or relatives are statistically significant.

Test of Hypothesis

To test the hypothesis that the rate of unemployment for laborers will worsen relative to the rate for craftsmen, we compare the annual relative unemployment rates of laborers and craftsmen for peak to trough years since 1947. Table 1 presents the unemployment rates of nonfarm laborers and craftsmen and gives the relative of the two classes. It can be seen that in each recession year there was an improvement in the relative position of laborers.⁶ This appears to be directly contradictory to the kind of behavior that our theory predicts. To resolve this apparent contradiction we try to discover any sources of bias that might give rise to this result.

Listed here are four possible sources of bias. We shall examine them one by one and try to show how they may be able to explain the contradiction:⁷

1. The linear assumption and the use of ratios
2. The use of unemployment rates to test an employment hypothesis
3. Peak to trough monthly changes and seasonality
4. The level of aggregation

⁶ Edwin Kuh was the first to call this dilemma to our attention. Robert Solow made the interesting observation that while the unemployment relative fell from peak to trough, it increased (worsened) from the trough to the first year of recovery in the last three post-war recessions.

⁷ A number of other potential biases are analyzed in Gruber and Cohen, op. cit. Any given analysis of unemployment rates is likely to have a set of possible biases that should be considered. We have chosen to concentrate on these particular four sources of bias. Deciding which sources of bias to consider in an analysis is still very much a matter of art because it is rarely possible to test for all possible potential bias. Our biases are more serious for analyses of unemployment rates, but in this example it is useful to trace both the employment and unemployment effects.

TABLE 1

Unemployment Rates for Craftsmen and Laborers,
Relative Rate and Overall Unemployment Rate -
Experienced Workers - 1947 - 1965

<u>Year</u>	<u>Craftsmen^d</u>	<u>Non-farm Laborers</u>	<u>Relative^b</u>	<u>Total Rate of Unemployment^c</u>
1947	3.8	7.5	1.97	3.6
1948	2.9	7.5	2.59	3.4
1949 ^a	5.9	12.9	2.19	5.5
1950	5.6	11.7	2.09	5.0
1951	2.6	5.6	2.15	3.0
1952	2.4	5.7	2.38	2.7
1953	2.6	6.1	2.35	2.5
1954	4.9	10.7	2.18	5.0
1955	4.0	10.2	2.55	4.0
1956	3.2	8.2	2.56	3.8
1957	3.8	9.4	2.47	4.3
1958	6.8	14.9	2.19	6.8
1959	5.3	12.4	2.34	5.5
1960	5.3	12.5	2.36	5.6
1961	6.3	14.5	2.30	6.7
1962	5.1	12.4	2.43	5.6
1963	4.8	12.1	2.52	5.7
1964	4.2	10.6	2.52	5.2
1965	3.6	8.4	2.33	4.6

^a Recession years are underlined.

^b Nonfarm laborers/craftsmen unemployment ratio.

^c Experienced workers

^d Craftsmen, foremen and kindred workers

Sources: Manpower Report of the President, 1965, p. 207; Monthly Report on the
the Labor Force, December, 1966.

1. The Linear Assumption and the Use of Ratios

It is not yet clear that the linear assumption we are making is a valid test of our hypothesis. If, for example, the unemployment rate of laborers increases by two points from five to seven percent while the unemployment rate of craftsmen increases from two to three percent, then laborer unemployment relative to craftsmen unemployment has become less severe since the rate for craftsmen went up 50 percent while the rate for laborers only went up by 40 percent with a consequent decline in the craftsman/laborer relative from 2.5 to 2.3. However, if we consider a two point increase in the unemployment rate of laborers more severe than a one point increase in the unemployment rate of craftsmen, a decrease in the relative ratio can be consistent with a worsening of the relative unemployment of laborers to craftsmen. In all four recessions the relative unemployment of laborers has worsened if we use magnitude of percentage point change rather than percentage change as our criterion for worsening.

For the remainder of our discussion we will accept the linear assumption and see if we can explain the paradox in other ways.

2. The Use of Unemployment Rates to Test an Hypothesis about Employment

Changes in unemployment, contrary to what might be expected, do not appear to follow changes in employment. There are several reasons for this which we have analyzed in some depth,⁸ such as the tendency

⁸See Gruber, op. cit. and Gruber and Cohen, op. cit. for an extended analysis of factors that affect the state of the unemployment rate structure.

of marginal workers to drop out of the labor force (hidden unemployment), and the problem of defining unemployment by industry and occupation of last attachment.

Table 2 (columns 5, 6, and 7) clearly demonstrates that changes in employment relate to changes in unemployment in a rather erratic way. For example, in the 1949 recession a 1.9 percent decline in the employment of all experienced workers resulted in a 120 percent increase in the rate of unemployment. In the 1961 recession a 3.8 percent decline in the employment of all experienced workers resulted in only a 65 percent increase in the rate of all unemployment of all experienced workers. Also interesting are differences between laborers and craftsmen. In the 1961 recession a 5.7 percent decrease in the employment of craftsmen resulted in a 159 percent increase in the craftsmen rate of unemployment. In contrast, a 25 percent decline in laborer employment resulted in only a 95 percent increase in the rate of unemployment of laborers.

The decision that unemployment rates were a poor basis for testing changes in the structure of employment led us to examine relative changes in employment for each of the postwar years. We used a method similar to the one by which relative unemployment was computed in Table 1. The results for employment relatives are presented in Table 3. With the exception of the 1960-61 recession our paradox still remains, since relative employment of laborers rose for the other three recessions,

PEAK TO TROUGH (a) CHANGES IN EMPLOYMENT AND UNEMPLOYMENT (b)

(Seasonally Unadjusted - Levels in thousands)

	Unemployment Rate		Changes (Peak to Trough)		Percentage Change (Peak to Trough)	
	Peak	Trough	Employment	Unem.	Emp.	Unemp. Rate
	(1)	(2)	(3)	(4)	(5)	(7)
1948-October	2.2	6.2	- 711	312	- 8.6	168.6
1949-October	4.9	12.4	- 216	286	- 6.1	158.0
All Exp. Workers	2.5	5.5	-1,133	1,891	- 1.9	122.6
1953-April-Oct. (average)	2.2	4.1	- 163	170	- 1.9	86.7
1954-July	4.9	10.2	+ 45	238	1.2	123.3
	2.2	4.5	+ 413	1,539	0.7	110.8
1957(c) July	3.1	7.1	- 309	368	- 3.5	131.0
1958 - Second Quarter	8.3	15.1	- 429	279	-10.6	75.8
	3.6	6.7	-3,238	2,085	- 4.8	83.1
1960-May	3.9	10.1	- 491	558	- 5.7	160.8
1961-February	9.9	19.3	-1,000	272	-25.3	62.5
	4.9	8.1	-2,553	2,236	- 3.8	64.6
						65.3

Sources: Computed from U.S. Department of Labor, Bureau of Labor Statistics, Monthly Report on the Labor Force; U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Series P-50, Annual Reports on the Labor Force; Current Population Reports Series P-50, No. 61; Current Population Reports, Series P-57.

- Notes: (a) Peaks and troughs are for the month or quarter nearest the NBER turning point for which data are available.
- (b) Data subject to considerable sampling error
- (c) Unemployment data before 1957 are not comparable due to change in definition of unemployment

TABLE 3

Employment by Occupation, 1947-1965, Number Employed
and Relative Employment, Laborers to Craftsmen
(Levels in Thousands)

<u>Year</u>	<u>Non-farm Laborers</u>	<u>Relative</u>	<u>Craftsmen^c</u>
1947	3526	.455	7754
1948	3473	.428	8119
1949 ^a	3365	.441	7625
1950	3520	.459	7670
1951	3952	.469	8434
1952	3707	.424	8743
1953	3656	.426	8588
1954	3603	.434	8311
1955	3681	.442	8328
1956	3670	.422	8693
1957	3680	.425	8664
1958 ^b	3669	.432	8487
1959	3743	.437	8561
1960	3665	.428	8560
1961	3477	.403	8623
1962	3559	.410	8678
1963	3551	.398	8925
1964	3624	.403	8986
1965	3855	.418	9221

Sources: Manpower Report of the President, p. 202; Monthly Report on the Labor Force, December, 1966.

^a Recessions are underlined.

^b Based on Bureau of Labor Statistics unpublished data. For all other years the unpublished data and published data agree. To make this table consistent with Table 6 we use the unpublished data for 1958. In 1958 employment of craftsmen was 8,469 while employment of laborers was 3,600 according to the Manpower Report of the President.

^c Craftsmen, foremen and kindred workers

while our hypothesis might have led one to expect it to fall.⁹

3. Peak to Trough Changes and Seasonality

Since yearly employment or unemployment rates are the average of monthly observations, they may obscure cyclical peaks and troughs. This is especially true when the length of time between a peak and trough is short and the annual average is based on only four months.¹⁰

In a further attempt to resolve our paradox we examine peak to trough changes in the laborer/craftsman relatives for employment and unemployment rates as presented in Table 4. The peaks and troughs correspond to the data closest to NBER reference points for which data are available.

An analysis of Table 4 (columns 1 and 2) clearly indicates a difference in the behavior of the relatives between the earlier and later recessions. In the first two recessions the laborer-craftsman employment relative increased. In the second two recessions this relative decreased substantially. The laborer-craftsman unemployment relative increased in the 1954 recession, fell somewhat in the 1949 recession, and fell much more in the recessions of 1958 and 1961.

⁹ Relative employment of laborers also increased in the first year of recoveries, but a secular shift prevented these cyclical effects from causing a shift upward in the relative over time. A systematic study of the cyclical and secular effects on the structure of employment and unemployment would be a useful contribution to the literature. The purpose of this paper, however, is to show the possible pitfalls of such a study.

¹⁰ Before 1958 all annual averages of unemployment by occupation are based on January, April, July and October.

PEAK TO TROUGH^a CHANGES IN EMPLOYMENT AND UNEMPLOYMENT^b

RELATIVES FOR LABORERS/CRAFTSMEN

(Seasonally Unadjusted)

		Employment ^d		Unemployment Rates	
		Peak	Trough	Peak	Trough
Peak	1948-October				
	Craftsmen	8,225	7,514	2.2	6.2
Trough	Laborers	3,518	3,302	4.9	12.4
	Laborer/craftsmen relative	.428	.439	2.23	2.00
Peak	1953-April-Oct. (Average)				
	Craftsmen	8,725	8,563	2.2	4.1
	Laborers	3,748	3,793	4.9	10.2
Trough	Laborer/Craftsmen relative	.430	.443	2.23	2.49
Peak	1957-July				
	Craftsmen	8,779	8,490	3.1	7.1
Trough	Laborers	4,064	3,635	8.3	15.1
	Laborer/Craftsmen relative	.462	.428	2.68	2.13
Peak	1960-May				
	Craftsmen	8,548	8,057	3.9	10.1
Trough	Laborers	3,955	2,955	9.9	19.3
	Laborer/Craftsmen relative	.463	.367	2.54	1.91

Sources: Computed from U.S. Department of Labor, Bureau of Labor Statistics, Monthly Report on the Labor Force; U.S. Department of Commerce, Bureau of the Census, Current Population, Series P-50, Annual Reports on the Labor Force; Current Population Reports Series P-50, No. 61; Current Population Reports, Series P-57.

- Notes: (a) Peaks and troughs are for the month or quarter nearest the NBER turning point for which data are available
- (b) Data subject to considerable sampling error
- (c) Unemployment data before 1957 are not comparable due to change in definition of unemployment.
- (d) In thousands

Our hypothesis is supported by the fact that there was a decrease in the employment relative in the latter two recessions. The result diametrically opposite / ^{when} measured by the unemployment relatives gives further evidence for confirming the validity of the observation that rates of unemployment are a poor test for an employment hypothesis. The lack of harmony that can be seen here between changes in employment and changes in the rate of unemployment should be considered when one evaluates the analyses of structural unemployment as related to changes in the business cycle.

The largest decrease in the employment relative occurred in the 1961 recession. This recession also created the largest improvement in the laborer-craftsmen unemployment relative. In an effort to explain this perplexing result, we analyzed differences in seasonal employment of laborers over time. July appears close to the seasonal peak of laborer employment and January close to the seasonal trough. In Table 5 we have presented the increase in seasonal employment. It will be seen that there is clearly a time effect in the increase in the seasonal employment of laborers. This effect may have caused part of the difference between the earlier and later recessions. One would expect that the increase in seasonal variation would, in any event, increase the overall unemployment rate of laborers, ceteris paribus, since more job changing would be associated with more unemployment at any point in time. It can be seen in Table 1 that the unemployment relative did not increase for laborers at periods of equal total rate of unemployment. This seems to mean that there has been an increase over time in the proportion of laborers who either drop out of the labor force or change occupations.

TABLE 5

Seasonal Change in Employment of Laborers and Craftsmen
(Levels in Thousands)

	<u>Laborers</u>			<u>Craftsmen</u>		
	<u>July</u>	<u>January</u>	<u>% Change</u>	<u>July</u>	<u>January</u>	<u>% Change</u>
65-66	4515	3386	- 25.0	9528	9058	- 4.9
64-65	4179	3404	- 18.6	9364	8714	- 7.0
63-64	4128	3131	- 24.2	9283	8604	- 7.3
62-63	4269	2973	- 30.4	9090	8475	- 6.8
61-62	4065	2985	- 26.6	8984	8190	- 8.8
60-61	4243	2963	- 30.2	8852	8155	- 7.9
59-60	4246	3309	- 22.1	8842	8422	- 4.8
58-59	4095	3143	- 23.2	8540	8325	- 2.5
57-58	4064	3290	- 19.0	8799	8421	- 4.3
56-57*	4050	3412	- 15.8	9047	8457	- 6.5
55-56	4047	3331	- 17.7	8720	8500	- 2.5
54-55	3793	3387	- 10.7	8562	7848	- 8.3
53-54	NOT AVAILABLE					
52-53*	4126	3470	- 15.9	9082	8308	- 8.5
51-52	4290	3600	- 16.1	8575	8130	- 5.2
50-51	3926	3779	- 3.7	7963	8092	+ 1.6
49-50	3593	3105	- 13.6	7578	7131	- 5.9
48-49	3779	3237	- 14.3	8203	7717	- 5.9
47-48	3780	3318	- 12.2	7762	7938	+ 2.3

Sources: U.S. Department of Labor, Bureau of Labor Statistics, Special Labor Force Reports, Nos. 3, 14, 23, 31, 43, 52; Monthly Report on the Labor Force, January, 1965, July, 1965, Employment and Earnings and Monthly Report on the Labor Force, February, 1966.

U.S. Department of Commerce, Bureau of the Census, Annual Reports on the Labor Force, P-50, Nos. 19, 31, 40, 45, 54, 72, 85; Monthly Report on the Labor Force, P-57, Nos. 157, 175, 187.

U. S. Department of Labor,, Unpublished data

* Change in definition of sample design. Both observations for line are for consistent definitions. Data subject to considerable sampling error.

(These are the two most plausible ways in which workers can leave employment and not create a rise in the rate of unemployment for the occupational class of workers so affected.) The 1961 recession trough occurred close to the seasonal low for laborer employment and this affected the employment relative but not the unemployment relative.

The seasonally adjusted employment and unemployment relatives at cyclical peaks and troughs are presented in Table 6.¹¹ A comparison with Table 4 indicates that the seasonal adjustment factor does change the direction of the relatives of employment in the 1958 recession, but the unemployment relatives and the 1961 recession employment relatives continue in the same direction in both unadjusted and seasonally adjusted data. In the first three recessions, the ratio of laborer to craftsman employment increases from peak to trough and in all but the 1954 recession the ratio of the laborer unemployment rates to the craftsman unemployment rate declines. This directly contradicts our hypothesis.

A comparison of the sharp decline in the laborer/craftsman employment relative in the recession of 1961 with the decline in the laborer/craftsman unemployment ratio is particularly perplexing. If the employment relative declines, the unemployment relative should increase. The paradox strongly validates the increased interest shown by economists regarding the question of the importance of labor force participation and the phenomenon of "hidden" unemployment.

¹¹Seasonally adjusted data were available only for the last two recessions.

RELATIVES FOR LABORERS/CRAFTSMEN

(Seasonally Adjusted)

	Employment ^d		Unemployment Rates	
	Peak	Trough	Peak	Trough
<u>1958 Recession</u>	July 1957	April 1958	July 1957	April 1958
Craftsmen	8,576	8,517	3.7	7.1
Laborers	3,534	3,570	9.6	15.6
Laborer/craftsmen relative	.412	.419	2.59	2.20
<u>1961 Recession</u>	May 1960	February 1961	May 1960	February 1961
Craftsmen	8,464	8,471	4.4	6.8
Laborers	3,874	3,329	10.8	13.8
Laborer/craftsmen relative	.458	.393	2.50	2.03

Source: U.S. Department of Labor, Bureau of Labor Statistics, unpublished data

- Notes:
- (a) Peaks and troughs are for the month or quarter nearest the NBER turning point for which data are available
 - (b) Data subject to considerable sampling error
 - (c) Unemployment data before 1957 are not comparable due to change in definition of unemployment
 - (d) In thousands

4. The Aggregation Bias

The increase in seasonality of laborers was particularly perplexing because the technological progress that has been made permits construction to continue during the winter season.¹² We therefore examined the data in disaggregated form and found that there has been a shift in the structure of laborer employment away from construction, manufacturing and transportation, toward trade and services. Data regarding this interesting shift are presented in Table 7.

Returning to our original hypothesis, there is no reason to use the employment of the entire economy to test the hypothesis. First, it is a micro hypothesis and may hold for a firm or industry but not for the economy as a whole. Second, the cyclical response of employment may differ among different industries, so we should use employment by skill for industries rather than for the economy. In Table 8, we take the ratio of laborer to craftsman employment for the annual peaks and troughs of the last two recessions, disaggregated by industry. We find that the data is not inconsistent with the hypothesis that employment will decline more substantially for unskilled workers than for skilled workers in a recession. The decline did occur in five of the six observations, and it is possible that construction, in the one observation where the employment relative did not decline,

¹² Seasonal employment is a function of the level of aggregate demand and weather conditions as well. During periods of very tight labor markets, employers might be expected to be less willing to hire and fire for seasonal conditions because of the difficulty in hiring workers after a seasonal decline. Weather increases the demand for workers in some seasons and reduces it in others. For example, there is less road construction and repair during the winter. A more severe or longer winter, ceterius paribus, would therefore mean less road construction. Another explanation for the increasing percentage change in employment from July to January throughout the post-war period is the increasing trend in summer employment particularly among students. (This observation was made by Michael Piore.)

TABLE 7.

Non-Farm Laborers-Percentage Employment by Industry - 1952 - 1964

	<u>Const.</u>	<u>Manuf.</u>	<u>Transp.</u>	<u>Trade</u>	<u>Service</u>	<u>Total</u>
1952	20.4	36.3	15.3	13.2	7.7	100.0
1954	20.1	35.7	16.4	12.8	8.5	100.0
1955	20.3	34.9	15.2	13.7	10.0	100.0
1956	19.6	35.3	14.3	14.1	10.4	100.0
1957	20.7	32.4	14.6	14.0	11.3	100.0
1958	22.2	29.8	13.5	14.0	12.6	100.0
1959	22.4	31.5	12.2	14.2	11.4	100.0
1960	21.7	31.1	14.9	14.9	10.7	100.0
1961	21.6	28.4	12.5	16.1	12.7	100.0
1962	21.0	28.6	12.3	16.1	13.2	100.0
1963	20.6	28.2	12.6	15.8	13.0	100.0
1964	21.7	28.3	11.5	16.2	13.3	100.0
1964*	22.1	28.7	11.8	16.4	13.5	100.0
1965*	21.3	28.5	11.8	17.5	13.5	100.0

Source: U.S. Department of Labor, Bureau of Labor Statistics, unpublished data. Data subject to considerable sampling variability, especially before 1958.

* Wage and salary workers only

did not in equal measure follow the cyclical decline in the 1957-58 recession.¹³

The disaggregation of the data presented gives results that contrast significantly with the annual averages of employment relatives given for the total economy (Columns 1 - 3 of Table 8 compared with Column 4). This finding, consistent with our hypothesis, applies only for the employment dimension of the laborer/craftsman hypothesis. Unemployment rates were not available for a parallel analysis similar to Table 8. It is possible that other sources of bias which do not affect the employment structure (such as dropouts from the labor force or the definition of unemployment as the last occupation and industry of attachment) may have caused the laborer/craftsman unemployment relative and the employment relative to act in opposite ways: A hypothesis that works for the employment structure may not work for the unemployment structure.

¹³ Following a suggestion of Nicholas Perna we tried to determine empirically if the "construction cycle" behaved differently from the "business cycle" in the last two recessions. We used an index of new private housing units authorized by local building permits (1957-59=100). In 1957-1958, when the construction relative in Table 6 moved in the opposite direction from the manufacturing relative, the index of new private housing authorized increased from peak to trough from 84.0 to 93.7. In the 1960-61 recession, the peak to trough movement of the index was 95.4 to 88.2 and in this recession both the manufacturing and construction relatives fell. The index of new private housing units authorized is seasonally adjusted. The peak to trough dates of the index are NBER turning point months. A more complete study of the cyclical behavior of sectors of the economy would be necessary before a definite causality could be determined for differences in the laborer/craftsman employment relative between industries. Source: U.S. Department of Commerce, Business Cycle Developments, June, 1965 Appendix F.

TABLE 8

Relative Employment (laborers to craftsmen), Two
Post-War Recessions by Industry, Annual Averages, Peak to Trough

<u>Recession</u>	<u>Manufacturing</u>	<u>Construction</u>	<u>Transport</u>	<u>All</u>
	(1)	(2)	(3)	(4)
1957 (Peak)	.353	.355	.507	.425
1958 (Trough)	.341	.389	.496	.432
1960 (Peak)	.355	.371	.465	.428
1961 (Trough)	.286	.350	.417	.403

Source: U.S. Department of Labor, Bureau of Labor Statistics,
calculated from unpublished data on occupation by industry.

Conclusion

The patterns of relative changes in unemployment and employment were analyzed in this paper in order to determine whether or not there would be a worsening of the position of unskilled workers (laborers) relative to skilled workers (craftsmen) during a recession. A hypothesis was developed that a worsening should occur, but an examination of postwar data appeared to contradict this hypothesis.

The order to resolve this paradox, four biases were examined: hidden unemployment, the linear assumption, peak to trough monthly changes and seasonality, and the level of aggregation. The lesson from this example appears to be clear: One should be aware of the sources of potential bias when testing an hypothesis because the success or refutation of the hypothesis may be based on potential sources of bias rather than on the veracity of the hypothesis. Careful formulation of the hypothesis may eliminate some of the sources of bias.

The decision as to whether or not a hypothesis has been properly tested must ultimately rest not only on the formulation of the hypothesis but on the availability of data for an adequate evaluation and on the energy and creativity of the researchers. We could have further refined our test of the hypothesis. We could have used quarterly data, factored out the secular and cyclical effects, added other classes for relative skill comparisons (such as professionals compared with clerical workers), and used regression analysis to hold these other variables constant.

It has been demonstrated in this paper that an affirmative or negative finding may be a result of the nature of the data selected or available to test the hypothesis, and not a result of the actual accuracy of the hypothesis under investigation.

BASEMENT

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